Under these conditions, therefore, the rms end to end distance may also be regarded as the relative measure of the radius of gyration.

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MAGNETIC PROPERTIES OF NATURAL CRYSTALS OF HEMATITE

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From magnetic measurements (Nèel *et al*, 1952; Lin, 1959) Within the temperature range 4°K to 950°K, of natural crystals of hematite (Elba), the presence of weak ferromagnetism and that of a transition in magnetic properties at about 250°K have been well established. From neutron diffraction studies (Shull *et al*, 1951) possibility of such a transition was ascribed to the change of the direction of the antiferromagnetic axis from that along the trigonal axis to that along the basal plane when the temperature is raised. Persistence of weak ferromagnetism even below 250°K which is contrary to the experimental observations with synthetic hematite (Guilaud, 1951), has been thought to be due to the presence of impurities, dislocations and non-uniformities in the lattice, which are usually present in the natural crystals. The magnetic behaviours of samples of hematite obtained from different origins are therefore expected to be different owing to the difference in the nature of the impurities and defects. But no experimental work has yet been reported to verify the suggestion. The study of the magnetic properties of a sample obtained from Brazil (Fe_2O_3 96.01% (with .5%FeO), SiO_2

1.7%, $TiO_2$1.9%, MgO .2%, Al_2O_3 .13%, S .1%, H_2O .15%) has therefore been undertaken. Measurements along different directions were made with different crystals obtained from the same sample and within the range 100°K to 1000°K. Results of measurements on a particular crystal are shown in fig. 1.

It is observed that below 250°K, magnetisation along the plane of fresh sample is much larger than that along the axis which is contrary to earlier observations (Néel 1952, Lin 1959). Also at these temperatures the susceptibility along the axis, unlike earlier observation, is quite comparable to that along the plane. The changes in the magnetic properties in the transition region are none too sharp or large as found by earlier observers. Such flattening has also been observed by Morin (1950) with synthetic hematite containing 1% Ti as impurity. The heat

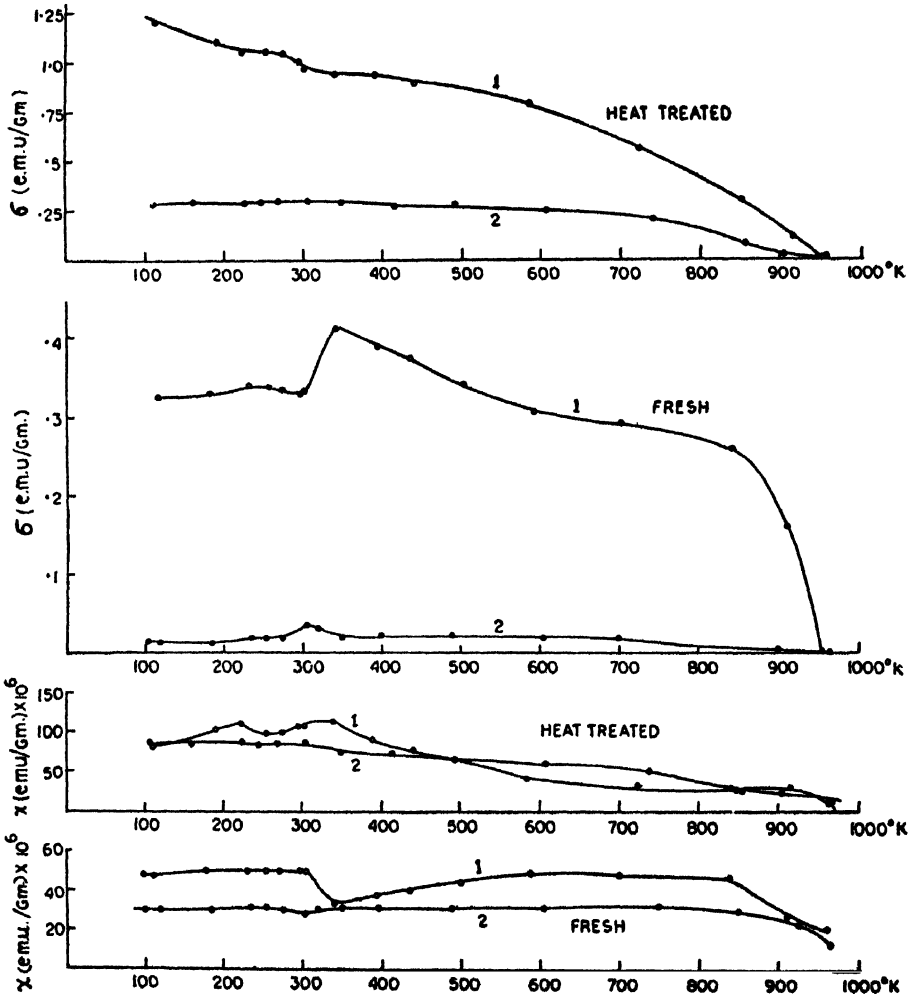

Fig. 1. Magnetisation (σ) and susceptibility (χ) at different temperatures of single crystals of hematite for fresh and heat treated samples. (1) along the basal plane (2) along the trigonal axis.

treatment of the samples during first cycle of measurement (in $\sim 10^{-3}$mm) changed the absolute values of the magnetisation and susceptibility, along both the directions considerably, nature of temperature variation of these quantities not being very much affected, only the changes near the transition region becoming flatter. The susceptibility at the Néel temperature and the Néel temperature itself however remain nearly the same as earlier observed i.e. $\sim 20 \times 10^{-6}$ C.G.S., e.m.u and 955 ± 5°K respectively and are not affected by heat treatment.

Crystalline defects to which all these observations may be ascribed are presumably in the form of dislocations or substitutions in the sublattices rather than in the form of any ferromagnetic impurity such as magnetite etc., in which case there ought to have been a sharp discontinuity in the temperature variation of the magnetisation curve at the Curie temperature of the impurity.

Further investigations to explain the above observations in view of its structural and chemical aspects is in progress.

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MICROWAVE SPECTRA OF ETHYLAMINE MOLECULE

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The ethylamine molecule is an asymmetric rotor. Exhaustive thermodynamic and infrared studies have not been made on this molecule. Some microwave absorption lines of ethylamine were observed by Matricon and Bonnet (1954). We have remeasured these lines and have extended the range of investigation.

The frequency range covered is 18.5 KMc/S to 26.0 KMc/S. Raytheon 2*K* 33B Klystron was used. In the region 20.5 K Mc/S—21.5K Mc/S the klys-